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HIGHLAND VALLEY COPPER

Highland Valley Copper is the country's largest base metal mine. Employing approximately **950** highly skilled workers the mine produces on average **one million pounds of copper and 22,000 pounds of molybdenum per day**. (Molybdenum is used to harden steel. Stainless steel is a good example.)

Highland Valley Copper **was formed in 1986** from two independent operations in the valley. Cominco's Valley Mine which had an aging mill complex but a large ore body and Lornex Mines' large mill and declining ore body. Later, Highmont Mining Corporation joined the Partnership and it's milling complex was moved to a site adjacent to the existing Lornex mill giving Highland Valley Copper the **second largest milling capacity in the world**.

Original interest in the valley was sparked in **1899** when prospectors discovered copper on the east side of the valley. Over the next 20 years, this area produced 97 tonnes of ore, albeit high-grade, averaging 30% copper, 170 grams of silver and 2.3 grams of gold per tonne.

Despite their best attempts, prospectors would be frustrated for the next 50 years in their efforts to make a major discovery in the Highland Valley. This wasn't for lack of skill or determination however, using the knowledge of the day, early prospectors were seeking high-grade vein-type copper deposits. They had no way of knowing that the Highland Valley hosted only porphyry-type copper deposits which, while they can be very large, are generally of low grade.

With the 1950's came global industrialization and a growing copper demand for use in electrical transmission. Thanks to advancements in mining and milling technology, in late **1962, Bethlehem Copper** (a predecessor of Cominco's Valley Mine and the first low grade copper mine in Canada,) was shipping copper concentrate from the Highland Valley.

While the legacy of the early prospector's determination lives on, the old Bethlehem mill has been removed, the land recontoured and seeded. One of the old mill's waste rock impoundment areas has been turned into productive crop land while another impoundment area (**Trojan Pond**) has been turned into a trophy trout fishery with Kamloops Rainbow trout growing to 11 pounds.

Today, Highland Valley Copper supplies the equivalent of **6% of North America's copper needs or 2% of the world's demand**. Its employees are amongst the highest paid workers in the province of BC with **an annual payroll of \$80 million**. An additional **\$200 million is spent on equipment, goods and services** makes the mine the economic mainstay of the communities of Logan Lake and Ashcroft and significantly impacts the economies of Merritt, Cache Creek and Kamloops. The **mine paid in excess of \$50 million in taxes to local, provincial and federal governments** in 2000 and along with its employees, donated an additional **\$150,000 to local and regional charities**.

The employees of this modern mine work in a **technically advanced environment using computers in almost every aspect of the operation** from payroll to maintenance scheduling and costing to the operation of the billion dollar concentrator complex. Short and long term mine plans are designed on computers that let the engineers see the ore body in three dimensions and any number of "what if" scenarios can be played out to ensure the safest and most economical extraction of the ore. Once the plan is set, drillers use satellites and global positioning technology to implement the engineer's plan exactly. While the large shovels and trucks also employ the latest technology such as computer dispatching, whenever possible, **the ore is crushed by semi-mobile crushers and transported to the mill via large overland conveyor systems**. This system has the advantage of being **both more economical and better for the environment than hauling ore with diesel powered trucks**.

The evolution of thinking is not isolated to production as **mining is now British Columbia's safest heavy industry and Highland Valley Copper has been recognized for 11 of the last 12 years as being the safest large mine in BC**. In fact, you have a greater chance of being injured while working in a movie theatre in BC than you do a Highland Valley Copper. * NB

Our joint occupational health, safety and environment committees meet monthly to discuss results of safety tours, review safe working procedures and evaluate all injury or environmental reports. Another joint committee has established the protocols for the re-employment of people temporarily or permanently disabled from their former job by reason of industrial or non-industrial injury or illness.

Rehabilitating the land is a way of life at the mine. Past and present mining activity has **disturbed a total of 6,200 hectares of which close to 1,500 hectares or over 24% has been revegetated for one or more years.** The reclaimed mine areas are already home to moose, deer, bald eagles, heron, fish, and coyotes. A four year study of 72 cattle grazing on reclaimed land completed in cooperation with Agriculture Canada and the BC Cattlemen's Association showed very positive results.

Since 1990, over 1.1 million trees and shrub stems have been manually planted in addition to the thousands of pounds of seeds placed by helicopter and fixed wing aircraft. Since 1996 the mine has received over 100,000 tonnes of treated sewage sludge from the Greater Vancouver Regional District for use on resloped rock dumps and tailings ponds. The product more properly termed "biosolids" appears to be very effective in re-establishing self-sustaining vegetation. It is also very graphic proof that **Vancouver's goal of recycling 100% of its sewage sludge by the year 2000 is a positive step for the protection of BC's environment.**

Mankind has been employing copper and its alloys for 10,000 years. First as weapons and jewelry, later as cooking pots, utensils and building materials. **Copper is one of the most recyclable of all metals** and today we use it in everything from fertilizer supplement and a spray to control potato blight to a faster, more compact replacement for silicone chips in computers. **Copper is used in watches, pipes, boilers, central heating and air conditioning, refrigeration, coins, making paper, ship building, food preparation and wiring from the smallest wires in a hearing aid to the those used to deliver power to our largest cities.**

Highland Valley Copper's current mine plan calls for **mine shut down late in the year 2009**. By this time, Highland Valley Copper since its formation in 1986 will have paid **over \$1.7 billion in wages and benefits and spent over \$4.5 billion on goods, services and supplies. This equates to over 25,000 person/years of direct employment and an additional 63,000 person/years of indirect employment.** The mine will have also provided over **8 billion pounds of copper** to a civilization preparing itself for the next millennium.

HIGHLAND VALLEY COPPER**Mine Notes:**

- ◆ The large pit in the Valley bottom is named (strangely enough) the “**Valley Pit**”.
(Miners have no imagination.)
- ◆ It is currently 450 meters deep (from Pit Control to the bottom)
- ◆ It will go down another 250 meters by end of mine life in 2009.
- ◆ Each bench is 15 meters high.
- ◆ We pump 27,000 litres of water per minute from the Valley Pit (used in process)
- ◆ We mine a total of 215,000 tonnes of rock per day. Half of this will be sent to the Mill for processing.
- ◆ Each tonne of ore containing rock contains about 4 kilograms of copper.
- ◆ Each shovel bucket (on the large shovels) holds 41 cubic yards of rock with a weight of 57 tonnes.
- ◆ We use twenty-seven 172 tonne (190 ton) and six 225 tonne (240 ton) haul trucks.
- ◆ Each haul truck can travel at 50 kilometers per hour loaded. (Total weight 325 tonnes.)
- ◆ Each truck has six tires. Tires last about 9 months and cost \$23,000 each.
- ◆ Since Highland Valley Copper started we have mined over a billion tonnes.
- ◆ That is enough material to build a land bridge between Vancouver Island and mainland of BC.
- ◆ Global positioning is used on the drills and the shovels.
- ◆ The trucks are monitored by local sensors and dispatched by the main control computer.

HIGHLAND VALLEY COPPER**Mill Notes:**

- ◆ The **Highland Mill** is a marvel of modern technology and size. It would cost over \$1 billion to build today.
- ◆ It processes 133,000 tonnes of rock per day.
- ◆ The product that is shipped is called concentrate. (It requires further refining before it is useable as copper.)
- ◆ We have the technology to build an environmentally safe refinery here but with the capital cost of \$280 million, taxation and power rates, it is cheaper for us to send our product to Japan.
- ◆ We ship approximately 1,100 tonnes of concentrate per day in up to 45 trucks to Ashcroft. (About 2/3 of this is waste material which explains why Japan is getting bigger!)
- ◆ It takes on average 5 to 7 semi-trucks per day to supply the goods we require.
- ◆ We use approximately the same amount of water in our mill per day as the city of Kamloops.
- ◆ We use enough electricity to supply a city of 300,000 people.
- ◆ We are BC Hydro's largest single location customer. Our Hydro bill alone exceeds \$3 million per month. (Approximately 1/3 of this is power taxes.)
- ◆ It takes approximately 450 people to keep the mill running 365 days per year. 220 are in maintenance, 180 in operations and the balance in technical and engineering support services.
- ◆ Most of the process is controlled by computer and monitored by five people although 26 in total are involved in ensuring pin point control for the most efficient extraction of the copper possible.

HIGHLAND VALLEY COPPER**The Process****Mining:**

- ◆ Engineers design a drilling pattern using known information on expected ore, rock hardness, short and long term planning and the most efficient use of equipment
- ◆ Large mobile drills using global positioning drill the pattern in accordance with the engineer's plan. Rock dust samples are collected for further analysis at the on-site assay laboratory.
- ◆ The "Blasting Crew" loads explosives made on site into the holes bearing in mind, rock hardness, safety factors, type of material and overall pit design.
- ◆ The pattern is blasted.
- ◆ Large electrically powered shovels move in and load the material onto haul trucks.
- ◆ The trucks, dispatched by computer, take the material to the semi-mobile crusher if it is copper bearing rock or "ore" or to a waste dump if there is insufficient copper to make further processing worthwhile.

Milling & Concentrating:

- ◆ Semi-mobile crushers reduce large rocks to 8" or less in diameter.
- ◆ Large overland conveyors transport the ore to one of three stockpiles.
- ◆ Material is extracted from under the stockpiles to feed one of five semi-autogenous mills. These large revolving drums use rocks to break other rocks following the addition of water.
- ◆ Coarse crushed material is pumped to smaller "ball mills" where steel balls are added to complete the grinding.
- ◆ Chemical reagents are added to create a froth or soap like bubbles.
- ◆ More reagents are added to collect the copper and attach it to the bubbles so that it can be skimmed off. (Molybdenum is extracted the same way in a different process.)
- ◆ The product is further cleaned, concentrated and dried ready for shipment.
- ◆ Waste product from the mill or "tailings" is transported to the storage dam where the solids settle out and the water can be pumped back for re-use in the mill.